

WE CLAIM:

CLAIMS

1. A method of communication between a base station located outside of a building structure and an interior mobile station located inside the building structure, the method comprising:

communicating over a wireless link channel using a link frequency with the base station, wherein at least a portion of the building structure is contained within a base station coverage region using a wireless coverage frequency for communication with one or more exterior mobile stations located outside of the building structure; and

communicating over a wireless distribution channel using a distribution frequency with a distribution station within the building structure, the distribution station configured to communicate with the interior mobile station using the coverage frequency.

2. A method in accordance with claim 1, wherein the communicating over the wireless link channel comprises:

receiving a link signal at the link frequency from the base station.

3. A method in accordance with claim 2, further comprising:

frequency shifting the link signal to a distribution frequency to form a distribution signal.

4. A method in accordance with claim 3, wherein the communicating over the wireless distribution channel comprises:

transmitting the distribution signal to the distribution station.

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5. A method in accordance with claim 1, wherein communicating over the wireless distribution channel comprises receiving a distribution signal from the distribution station at the distribution frequency.

6. A method in accordance with claim 5, further comprising:
frequency shifting the distribution signal to the link frequency to form a link signal.

7. A method in accordance with claim 6, wherein the communicating over the wireless link channel comprises:
transmitting the link signal to the base station.

8. A method in accordance with claim 1, wherein the communicating over the wireless link channel comprises:
receiving a downstream link signal at a downstream link frequency from the base station and transmitting an upstream link signal at an upstream link frequency.

9. A method in accordance with claim 8, wherein the communicating over the wireless distribution channel comprises:
receiving an upstream distribution signal from the distribution station at an upstream distribution frequency and transmitting a downstream distribution signal at a downstream distribution frequency to the distribution station.

10. A method in accordance with claim 9, further comprising:
frequency shifting the downstream link signal to the downstream distribution frequency to form the downstream distribution signal and frequency shifting the upstream distribution signal to the upstream link frequency to form the upstream link signal.

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11. A method in accordance with claim 10, wherein the wireless link channel comprises a plurality of link frequencies including at least the upstream link frequency and the downstream link frequency.

12. A method in accordance with claim 1, further comprising:
communicating with the interior mobile station using the coverage frequency.

13. A method in accordance with claim 1, wherein the wireless coverage channel is established between the exterior mobile station and an exterior interface station communicating with the base station.

14. A method in accordance with claim 1, wherein wireless service is provided to exterior mobile stations within the base station coverage region through a plurality of interface stations communicating with the base station using the wireless link channel and communicating with the exterior mobile stations using the wireless coverage channel.

15. A method in accordance with claim 14, wherein the wireless link channel comprises a plurality of link frequencies and the wireless coverage channel comprises a plurality of coverage frequencies.

16. A method of communication between a base station located outside of a building structure and an interior mobile station located inside the building structure, the method comprising:

transmitting, from the base station, a downstream link signal to a building interface station;

frequency shifting, at the building interface station, the downstream link signal from the downstream link frequency to a downstream distribution frequency to form an downstream distribution signal;

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transmitting the downstream distribution signal to a distribution station;
frequency shifting, at the distribution station, the downstream
distribution signal to the downstream coverage frequency to form an interior
downstream coverage signal;

transmitting the interior downstream coverage signal to the interior
mobile station; and

transmitting an exterior downstream coverage signal at the
downstream coverage frequency to an exterior mobile station within a base station
service region.

17. A method in accordance with claim 16, further comprising:

frequency shifting, at the building interface station, the
downstream link signal from the downstream link frequency to the downstream
coverage frequency to form the interior downstream coverage signal; and

transmitting the interior downstream coverage signal from the building
interface station to the interior mobile station.

18. A method in accordance with claim 16, further comprising:

receiving, at the distribution station, an interior upstream coverage
signal from the interior mobile station.

frequency shifting the interior upstream coverage signal from an
upstream coverage frequency to an upstream distribution frequency to form an
upstream distribution signal;

transmitting the upstream distribution signal to the building interface
station;

frequency shifting, at the building interface station, the upstream
distribution signal from the upstream distribution frequency to an upstream link
frequency to form an upstream link signal;

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22. A method comprising:

communicating over a wireless distribution channel using a distribution frequency with a building interface station configured to communicate over a wireless link channel with an exterior base station located outside of a building structure;

communicating over a wireless coverage channel using a coverage frequency with an interior mobile station located inside the building structure, the coverage frequency used for communication with exterior mobile stations located outside the building structure and within a base station coverage region, wherein at least a portion of the building structure is contained within the base station coverage region.

23. A method in accordance with claim 22, wherein the communicating over the wireless distribution channel comprises receiving a downstream distribution signal from the building interface station, the downstream distribution signal corresponding to a downstream link signal transmitted from the base station.

24. A method in accordance with claim 23, further comprising:
frequency shifting the distribution signal from a distribution frequency to a coverage frequency to form a coverage signal.

25. A method in accordance with claim 24, wherein the communicating over the wireless coverage channel comprises:

transmitting the coverage signal to the interior mobile station.

26. A method in accordance with claim 22, wherein communicating over the wireless coverage channel comprises receiving a coverage signal from the interior mobile station at the coverage frequency.

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27. A method in accordance with claim 26, further comprising:

frequency shifting the coverage signal to the distribution frequency to
 tion signal.

28. A method in accordance with claim 27, wherein the communicating
the wireless distribution channel comprises:

transmitting the distribution signal to the base interface station.

29. A method in accordance with claim 22, wherein the communicating e wireless distribution channel comprises:

receiving a downstream distribution signal at a downstream distribution
n the base interface station and transmitting an upstream distribution
stream distribution frequency.

30. A method in accordance with claim 29, wherein the communicating
the wireless coverage channel comprises:

receiving an upstream coverage signal from the interior mobile station

at an upstream coverage frequency and transmitting a downstream coverage signal at a downstream coverage frequency to the interior mobile station.

31. A method in accordance with claim 30, further comprising:

frequency shifting the downstream distribution signal to the

downstream coverage frequency to form the downstream coverage signal and frequency shifting the upstream coverage signal to the upstream distribution frequency to form the upstream distribution signal.

32. A method in accordance with claim 31, wherein the wireless

distribution channel comprises a plurality of distribution frequencies including at least the upstream distribution frequency and the downstream distribution frequency.

33. A method in accordance with claim 22, wherein the wireless coverage channel is established between the exterior mobile station and an interface station communicating with the base station.

34. A method in accordance with claim 22, wherein wireless service is provided to exterior mobile stations within the base station coverage region through a plurality of interface stations communicating with the base station using the wireless link channel and communicating with the exterior mobile stations using the wireless coverage channel.

35. A method in accordance with claim 34, wherein the wireless link channel comprises a plurality of link frequencies and the wireless coverage channel comprises a plurality of coverage frequencies.

36. A system comprising:
a building interface station configured to communicate with a base station through a wireless link channel; and
a distribution station communicatively connected to the building interface station through a wireless distribution station, the distribution station configured to communicate with interior mobile stations within a building structure using a coverage frequency used for communication with exterior mobiles outside of the building structure and within a base station coverage region, wherein at least a portion of the building structure is within the base station coverage region.

37. A system in accordance with claim 36, further comprising:
a base station communicatively connected to the building interface station through the wireless link channel.

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38. A system in accordance with claim 37, further comprising:
an interior mobile station communicatively connected to the
distribution station through a wireless coverage channel using the coverage frequency.

39. A system in accordance with claim 38, further comprising:
a plurality of exterior interface stations communicatively connected to the base
station, the exterior interface stations configured to communicate with the exterior
mobile stations using the coverage frequency.

40. A system in accordance with claim 39, wherein the wireless link
channel comprises a plurality of link frequencies and the wireless coverage channel
comprises a plurality of coverage frequencies.

41. A system in accordance with claim 40, wherein the building interface
station comprises:
a first communication interface configured to communicate through a
wireless link channel with a base station; and
a second communication interface configured to communicate
through a wireless distribution channel with a distribution station, the second
communication interface further configured to communicate through a wireless
coverage channel with mobile stations within a building structure using a coverage
frequency used by exterior mobile stations outside of the building structure within a
base station coverage region.

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42. A system in accordance with claim 41, wherein the building interface further comprises:

- a downstream frequency shifter configured to shift a downstream link signal received at the first communication interface to a downstream distribution frequency and to a downstream coverage frequency; and

- an upstream frequency shifter configured to shift an upstream distribution signal received at the first communication interface and an upstream coverage signal to an upstream link frequency.

43. An apparatus in accordance with claim 42, wherein the first communication interface comprises:

- an antenna configured to receive the downstream link signal and to transmit the upstream link signal.

44. An apparatus in accordance with claim 43, wherein the second communication interface comprises:

- an antenna configured to receive the upstream coverage signal and the upstream distribution signal and configured to transmit the downstream coverage signal and the downstream distribution signal.

45. An apparatus in accordance with claim 44, wherein the second communication interface comprises:

- a distribution communication interface configured to communicate through the wireless distribution channel with the distribution station; and

- a coverage communication interface configured to communicate through the wireless coverage channel with mobile stations within the building structure using the coverage frequency.

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46. An apparatus in accordance with claim 45, wherein the distribution communication interface comprises:

an antenna configured to receive the upstream distribution signal and to transmit the downstream distribution signal.

47. An apparatus in accordance with claim 45, wherein the coverage communication interface comprises:

an antenna configured to receive the upstream coverage signal and to transmit the downstream coverage signal.

48. A system in accordance with claim 41, wherein the distribution station comprises:

a distribution communication interface configured to communicate through a wireless distribution channel with a building interface station using distribution signals corresponding to link signals used for communication between the building interface station and a base station; and

a coverage communication interface configured to communicate through a wireless coverage channel with interior mobile stations within a building structure using a coverage frequency used by exterior mobile stations outside of the building structure within a base station coverage region of the base station.

49. A system in accordance with claim 41, wherein the distribution station further comprises:

a downstream frequency shifter configured to shift a downstream distribution signal received at the distribution communication interface to a downstream coverage frequency; and

an upstream frequency shifter configured to shift an upstream coverage signal to an upstream distribution frequency.

50. A system in accordance with claim 49, wherein the distribution station further comprises:

an antenna configured to receive the downstream distribution signal and to transmit the upstream distribution signal.

51. A system in accordance with claim 49, wherein the distribution station further comprises:

an antenna configured to receive the upstream coverage signal and to transmit the downstream coverage signal.

52. A building interface station.

53. An apparatus comprising:

a first communication interface configured to communicate through a wireless link channel with a base station; and

a second communication interface configured to communicate through a wireless distribution channel with a distribution station, the second communication interface further configured to communicate through a wireless coverage channel with mobile stations within a building structure using a coverage frequency used by exterior mobile stations outside of the building structure within a base station coverage region.

54. An apparatus in accordance with claim 53, further comprising:

a downstream frequency shifter configured to shift a downstream link signal received at the link communication interface to a downstream distribution frequency and to a downstream coverage frequency; and

an upstream frequency shifter configured to shift an upstream distribution signal received at the link communication interface and an upstream coverage signal to an upstream link frequency.

55. An apparatus in accordance with claim 54, wherein the first communication interface comprises:

an antenna configured to receive the downstream link signal and to transmit the upstream link signal.

56. An apparatus in accordance with claim 54, wherein the second communication interface comprises:

an antenna configured to receive the upstream coverage signal and the upstream distribution signal and configured to transmit the downstream coverage signal and the downstream distribution signal.

57. An apparatus in accordance with claim 54, wherein the second communication interface comprises:

a distribution communication interface configured to communicate through the wireless distribution channel with the distribution station; and

a coverage communication interface configured to communicate through the wireless coverage channel with mobile stations within the building structure using the coverage frequency.

58. An apparatus in accordance with claim 57, wherein the distribution communication interface comprises:

an antenna configured to receive the upstream distribution signal and to transmit the downstream distribution signal.

59. An apparatus in accordance with claim 57, wherein the coverage communication interface comprises:

an antenna configured to receive the upstream coverage signal and to transmit the downstream coverage signal.

60. A distribution station.

61. An apparatus comprising:

a distribution communication interface configured to communicate through a wireless distribution channel with a building interface station using distribution signals corresponding to link signals used for communication between the building interface station and a base station; and

a coverage communication interface configured to communicate through a wireless coverage channel with interior mobile stations within a building structure using a coverage frequency used by exterior mobile stations outside of the building structure within a base station coverage region of the base station.

62. An apparatus in accordance with claim 61, further comprising:

a downstream frequency shifter configured to shift a downstream distribution signal received at the distribution communication interface to a downstream coverage frequency; and

an upstream frequency shifter configured to shift an upstream coverage signal to an upstream distribution frequency.

63. An apparatus in accordance with claim 62, wherein the distribution communication interface comprises:

an antenna configured to receive the downstream distribution signal and to transmit the upstream distribution signal.

64. An apparatus in accordance with claim 62, wherein the coverage communication interface comprises:

an antenna configured to receive the upstream coverage signal and to transmit the downstream coverage signal.

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